

UTILITY PATENT APPLICATION TRANSMITTAL

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Attorney Docket No.	109993.00103
First Inventor or Application Identifier	Walter Mason STEWART
Title	E-MAIL VIRUS PROTECTION SYSTEM AND METHOD

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents

1. ☒ Fee Transmittal Form (e.g. PTO/SB/17)
(Submit an original and a duplicate for fee processing)
2. ☒ Specification Total Pages **18**
3. ☒ Drawing(s) (35 U.S.C. 113) Total Sheets **3**
4. ☒ Oath or Declaration Total Pages **2**
 - a. ☒ Newly executed (original or copy)
 - b. ☐ Copy from a prior application (37 C.F.R. §1.63(d))
(for continuation/divisional with box 15 completed)
 - i. ☐ DELETION OF INVENTOR(S)
Signed statement attached deleting inventor(s) named in the prior application, see 37 C.F.R. §1.63(d)(2) and 1.33(b)
5. ☐ Incorporation By Reference (usable if box 4B is checked)
The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4B, is considered to be part of the disclosure of the accompanying application and is hereby incorporated by reference therein.

ADDRESS TO: Assistant Commissioner for Patents
Box Patent Application
Washington, DC 20231

ACCOMPANYING APPLICATION PARTS

6. ☒ Assignment Papers (cover sheet & document(s))
7. ☐ 37 C.F.R. §3.73(b) Statement (when there is an assignee) ☐ Power of Attorney
8. ☐ English Translation Document (if applicable)
9. ☐ Information Disclosure Statement (IDS)/PTO-1449 ☐ Copies of IDS Citations
10. ☐ Preliminary Amendment
11. ☒ White Advance Serial No. Postcard
12. ☒ Small Entity Statement(s) ☐ Statement filed in prior application. Status still proper and desired.
13. ☐ Certified Copy of Priority Document(s) (if foreign priority is claimed)
14. ☐ Other:

15. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below:

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application no.:
Prior application information: Examiner: Group Art Unit:

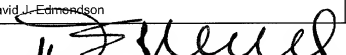
16. Amend the specification by inserting before the first line the sentence:

☐ This application is a ☐ Continuation ☐ Division ☐ Continuation-in-part (CIP)
of application Serial No. Filed on

☒ This application claims priority of provisional application Serial No. 60/213,254 Filed June 22, 2000

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Packet No.

109933.00103

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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AL NO: New Application

FILE DATE: Herewith

E-MAIL VIRUS PROTECTION SYSTEM AND METHOD

FEE TRANSMITTAL

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FOR	NUMBER FILED	NUMBER EXTRA	RATE	CALCULATIONS
TOTAL CLAIMS	41 - 20 =	21	× \$18 =	\$378.00
INDEPENDENT CLAIMS	3 - 3 =	0	× \$80 =	\$0.00
<input type="checkbox"/> MULTIPLE DEPENDENT CLAIMS (If applicable)			+ \$260 =	\$0.00
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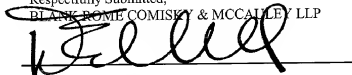
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Date: November 3, 2000

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005011-06240260

Docket No. 109933.0010+3

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF: STEWART et al.

GAU: not yet assigned

SERIAL NO: new application

EXAMINER: not yet assigned

FILED: herewith

FOR: E-MAIL VIRUS PROTECTION SYSTEM AND METHOD

SMALL ENTITY DECLARATION - SMALL BUSINESS CONCERN

I hereby declare that I am:

☒ The owner of the small business concern identified below:☐ An official of the small business concern empowered to act on behalf of the concern identified below:

Name of Concern:

Infobahn, Inc.

Address of Concern:

2304 Stratton Drive, Potomac, Maryland 20854

I hereby declare that the above-identified small business concern qualifies as a small business concern as defined in 13 CFR 121.3-18, and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees under section 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both. I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention described in

☐ the specification filed herewith.☒ the application or patent described above.

If the rights held by the above-identified small business concern are not exclusive, each individual, concern or organization having rights to the invention is listed below. No rights to the invention are held by any person, other than the inventor, who could not qualify as an independent inventor under 37 CFR 1.9(c) or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

☐ no such person, concern or organization.☒ persons, concerns or organizations listed below. (NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities, 37 CFR 1.27)

Full Name	Address	Individual	Small Business Concern	Nonprofit Organization

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate; 37 CFR 1.28(b).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

Name

Title

Signature

Date

Mason Stewart
Mason Stewart

Treasurer
Treasurer

[Signature]

E-MAIL VIRUS PROTECTION SYSTEM AND METHOD

REFERENCE TO RELATED APPLICATION

The present application claims the benefit of U.S. Provisional Application No. 60/213,254, filed June 22, 2000, whose disclosure is hereby incorporated by reference in its entirety into the present disclosure.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to computer systems and computer networks. In particular, the present invention relates to a system and method for detecting and nullifying the effects of computer viruses. Still more particularly, the present invention relates to a system and method for detecting and nullifying the effects of computer viruses from messages and attachments delivered by electronic mail through a network.

2. Description of the Related Art

Computer viruses are a destructive aspect of the computer revolution that threatens its potential growth and usability. Significant time and money are lost annually combating the effects of this insidious, and seemingly endemic, problem. A computer virus is actually just an unauthorized block of executable computer code purporting to be harmless or is hidden in another valid computer program. Once the valid program is executed, the unauthorized virus code is also activated. The effect of such viruses can be simple pranks, such as causing messages to be displayed on the screen, or more serious activities, such as destroying programs and data. Once executed, they often spread quickly by attaching themselves to other programs in the system. Infected programs may in turn continue the cancerous replication by copying the virus code to still other programs. The proliferation of Internet E-mail has only accelerated the problem in that local viruses can now spread internationally in a matter of hours.

Prior art attempts to reduce the effects of viruses and prevent their proliferation by using various virus detection schemes have been only marginally successful. The reason for the limited success is that the prior art methods attempt to identify the existence of a virus before taking steps to protect a user. For example, many virus detection programs use a method known as "behavior interception," which monitors the computer or system for key system functions such as "write," "erase," "format disk," etc. When such operations occur, the virus detection program prompts the user for input as to whether such an operation is expected. If the suspect operation was not expected (e.g., the user was not operating any program that employed such a function), the user can abort the operation. Another virus detection method, known as "signature scanning," scans program code that is being copied onto the system. Again, the virus detector searches for recognizable patterns of program code, such as the program attempting to write into specific file or memory locations, that betray the possible existence of a virus. Yet another prior art approach to virus detection performs a checksum (mathematical signature) on critical programs stored on a system that are known to be free of viruses. If a virus later attaches itself to one of these programs, the checksum value--which is periodically recalculated--will be different and thus, the presence of a virus detected.

While all of these methods work to some degree, they tend to suffer from one critical drawback: They depend on recognizing the virus as a virus before instituting any protection for the user. All too often, new (unrecognized) viruses must first wreak havoc on a significant number of victims before the new virus' identifying characteristics are recognized and included in the (ever-lengthening) watch lists of the various virus protection programs available to government and industry.

SUMMARY OF THE INVENTION

The present invention overcomes the limitations of the prior art by implementing a system and method that eliminates the threat of viruses transmitted on a computer network by rendering any viruses inoperable. As discussed above, all viruses are programs. Like all programs, they are designed to run in a specific or predictable environment. Viruses depend on a host computer's operating system to recognize them as valid programs. They also depend on the host computer's central processing unit (CPU) to understand the virus' commands and obey them. Non executable entities are, by nature, incapable of launching a virus. Therefore, if a host computer converts all data received via e-mail (mail and attachments) to non-executable entities, any embedded virus is rendered inoperable. The present invention describes a method and system of virus protection that involves passing all e-mail and attachments through various conversion states that, while harmless to e-mail text and attachments, the conversions are lethal to executable code (viruses).

Even though the majority of e-mail received by a company or government agency should contain no valid executable components, a small percentage of e-mail attachments, such as "working drafts," and standard contract templates may require user updating or valid executable macros. Therefore, the present invention also describes a system and method of identifying "Approved" embedded macros and--as long as they have not been modified--allowing them to survive the virus killing conversions.

Finally, the present invention also includes a unique "sacrificial PC " system and method capable of safely executing, detecting (via examination of the results of execution), and safely recovering from potentially virus-laden e-mails.

BRIEF DESCRIPTION OF THE DRAWINGS

A preferred embodiment will be set forth in detail with reference to the drawings, in which:

Fig. 1 shows a block diagram of an e-mail gatekeeper system;

Fig. 2 shows a flow chart of operations carried out in the e-mail gatekeeper system;

and

Fig. 3 shows a flow chart of operations carried out by a sacrificial processor.

5 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Though not essential to every embodiment of this invention, the preferred embodiment makes use of the following concepts and principles:

1. Recipients of e-mails are ultimately more qualified to determine what information is acceptable than a generalized software program or system
2. If given an opportunity, a user can clearly define which e-mail types and attachments he or she does or does not wish to receive.
3. The ability of users to accept macros and other forms of executable code commonly used in modern computer generated business forms and templates must be maintained.
4. All information is potentially important to a user. Therefore, software systems, including security programs, should not arbitrarily delete or withhold e-mail content without specific knowledge and authorization of the owner of the e-mail system.
5. The value of information tends to decrease over time. Therefore, information contained in e-mails should not be unreasonably delayed.

The gatekeeper method and system described herein operate under the following rules and definitions:

1. Any macro or executable code that alters the physical appearance of an e-mail or attachment is considered by the gatekeeper to be a customized form.

2. All customized forms requiring user input must be authorized by the owner of the e-mail system.

In an effort to provide recipients with all of the contents of all e-mails and attachments (not prohibited by the owner of the e-mail system) all unauthorized form will be executed; however, the form's output (not the form itself) will be delivered to the user in a "safe" non-executable format.

The Gatekeeper method and system described defines and ability to authorize and authenticate all forms.

The virus detection system and method of the present invention preferably operates on a system as depicted in FIG. 1.

An intermediary E-mail security server (102), referred to as "the Gatekeeper" intercepts all e-mail messages and attachments sent by a sender (101) via a communications network, such as the Internet (109). The arriving unopened e-mail and attachments are archived and logged (202) with a date and time stamp, plus any routing information available. Address data is then stripped off of the e-mail (204) for attachment to the "safe" e-mail constructed at (210). The e-mail portion of the Internet e-mail received from (201) is passed through a conversion process (205) that eliminates all executable code leaving only alphanumeric message text. Any imbedded hyperlinks or email addresses, while still identifiable as links or addresses, are rendered inoperable as executable "links." The Gatekeeper (102) then checks to see if the arriving e-mail contains an attachment (206). If the e-mail contains no attachment, processing continues at step (210).

If the e-mail contains an attachment, the attachment types (extensions) are validated against several lists provided by the client during the installation process. The e-mail

attachment type is first checked against a list of client approved acceptable file extensions. If the attachment extension is not in the approved list, it is considered either disapproved or unknown. (212). If the attachment extension type is found in the disapproved list, a message is constructed indicating that "this e-mail contains a disapproved attachment." The disapproval message is included in the safe e-mail constructed in step (210).

If the e-mail contains an attachment with an extension that is not in either the "disapproved" or "approved" lists, the entire attachment is passed through a conversion process (205) that eliminates all executable code leaving only alphanumeric message text. This process will generally create a readable copy of the attachment, but will not allow the attachment to open any processes or applications, including executable virus code. If the included attachment from (206) is of an approved extension type, attachment inspection processing continues at (208), which checks the approved attachment extension to see if it contains any executable code (macros). This process involves reading the attachment file's internal format and identifying any executable code, such as macros that may be present. Any executable code found is noted and identified for authentication (209). An encrypted authentication identifier is created for the executable code by passing it through an algorithm such as, a checksum or hashing algorithm (213), that uniquely identifies the string of executable code. The unique identifier is then encrypted using a key known only to the Gatekeeper program or server. The authentication identifier is then compared to a list of approved code contained by the Gatekeeper and supplied by the Client (216). Since this system and method described validates only the executable code (macros), the non-executable data portion of the attachment can safely be changed or updated interactively. If the attachment contains approved macros, the original attachment is made available to the recipient. If the attachments contain unapproved macros, the attachment is forwarded to an available sacrificial PC processor (103) via data link (108) for conversion to a non-executable

format and further detailed virus testing. The method just described for detecting, authenticating, and approving a macro can be used to authenticate and approve any form of executable code embedded in an attachment or in the body of an e-mail message. Such code can include compiled programs, interpretive code, scripts, batch language, markup language code, or the like located in any part of the e-mail message, including the body and the attachments.

Sacrificial PC processing begins with the original e-mail attachment being passed to an available sacrificial PC (105) via a data link (108) connecting the Gatekeeper server (102) with the sacrificial PC. Once the transfer of the attachment is complete the data link (108) is intentionally broken. This eliminates the possibility of any unintended communications back to the Gatekeeper. The original attachment is then opened using standard Windows application processing supplied by the client (303). The opened attachment is then passed through a process (304) which converts the attachment to a non-executable image format, such as Portable Document Format (PDF). Note there are many suitable image formats. The process would choose one selected by the client. The safe image format version of the attachment is then encrypted in the sacrificial PC's unique authentication key assigned by the Gatekeeper at startup. The data link (108) to the Gatekeeper is then re-established (306) and the encrypted non-executable attachment is returned to the Gatekeeper (307).

All communications from a sacrificial PC to the Gatekeeper are interrogated by the Gatekeeper's communications processor (220). Before being accepted by the Gatekeeper as a valid message, the data must pass a strict authentication test (219). The authentication process is as follows.

At System startup (and periodically, if desired) the Gatekeeper creates a randomly generated set of authentication parameters to be used by each sacrificial PC when communicating with the Gatekeeper. When a sacrificial PC wants to communicate with the

Gatekeeper it first sends a handshake packet to the Gatekeeper identifying the specific PC requesting communication. It also sends a short (unencrypted) clear-text portion of the data to be communicated encapsulated within the handshake packet.

Once the Gatekeeper acknowledges the handshake, the sacrificial PC sends the full information packet to the Gatekeeper. A random amount of the packet has been encrypted in the sacrificial PC's unique key. The specific amount of data encrypted by the sacrificial PC was determined by one of the authentication parameters sent by the Gatekeeper at startup. The Gatekeeper decrypts all data packets it receives based on the assumed key of the specific sacrificial PC. In other words, "If you are who you say you are, you encrypted your data in the following way." Once decrypted, the Gatekeeper compares the clear text portion of the data received in the handshake packet with the decrypted data packet (219). If they match, the data is accepted; if they do not, the data is not accepted. The authentication technique is based on known "challenge and response" authentication techniques.

Once the sacrificial PC has sent the read only "safe" attachment back to the Gatekeeper, a special validation process examines the sacrificial PC to determine if any unexpected changes have occurred (308) and (309) on the sacrificial PC. Unexpected changes could include the addition or deletion of files, files that change name, extension, or content unexpectedly, (including morphing of the tested attachment itself), attempted sensing of the date and time features of the sacrificial PC, etc.

Also, when the opportunity is available, as with attachments created using the Microsoft suite of office products, the sacrificial PC processor takes advantage of the "Enable Macros" "Disable Macros" feature. This built-in feature makes it possible to open a document without allowing any embedded code (macros) to execute. Two copies of the same document can then be created, one created with macros executed and one created without macros executed. The two copies of the same document can then be examined to determine

if executing the macro had any effect on the information content of the document. By comparing the two documents, the sacrificial PC can determine whether or not the macro is relevant to the particular document being tested.

If execution of the macro was necessary to produce the information contained in the tested document, then the macro's contribution is contained in the print image copy of the document produced by the sacrificial PC when it executed the document with macros enabled. This is the copy that is sent to the recipient.

Similarly, if testing the document with "macros disabled" has no impact on the content of the document, then the suspect macro is not necessary. It logically follows then, that the suspect macro is either irrelevant to the content the particular version of the document being tested or, **it is a virus**. In either case, the sacrificial PC has intercepted and nullified the suspect macro's impact on the recipient.

Any unexpected changes in the system trigger a virus alert. Standard user security processes alert all authorized personnel (309). A special "ghosting" reload of the operating system then takes place. The process is as follows.

Each Sacrificial PC is configured with two hard drives. Each hard drive is configured with a single active partition and contains a safe copy of the operating system obtained from the read-only device (110). The designated active partition--defined at start-up--is "toggled" between the two physical hard drives. This is done to increase the speed of reloading and to maximize the availability of sacrificial PCs. The unused drive--which is the one used to test the last attachment-- is re-loaded, via ghosting software (310), with a fresh copy of the operating system obtained from the read only CD ROM (110). The connection between the Gatekeeper (102) and the sacrificial PC (105) is then re-established.

Once the sacrificial PC is re-ghosted, it is brought back on line and the GateKeeper assigns it a new authentication Key and encryption length parameter.

Once the Gatekeeper sends data to a sacrificial PC, it notes the time the data was sent. If no data is received back from a sacrificial PC within a specified period of time (typically two minutes), the Gatekeeper assumes the sacrificial PC has become the victim of a virus and died. When this occurs, the Gatekeeper signals a virus alert and requests human intervention
5 to recover the dead sacrificial PC.

The method and system described above can also be implemented with the sacrificial PC implemented as a virtual machine or environment in the operating system of another computer. This computer could be the gatekeeper, an e-mail server or any other computer.

The method and system described above also be implemented with the gatekeeper
10 system implemented as part of another system, such as a component of an already existing e-mail server.

The gatekeeper system and method described uses the file and macro authentication and encrypted client approval techniques described above to protect itself from both internal and external "hacking" attacks that may attempt to substitute, modify, destroy or otherwise
15 nullify gatekeeper files and programs.

While a preferred embodiment has been set forth in detail above, those skilled in the art who have reviewed the present disclosure will readily appreciate that other embodiments can be realized within the scope of the invention. For example, the use of certain hardware, operating systems, or the like should be construed as illustrative rather than limiting.
20 Therefore, the present invention should be construed as limited only by the appended claims.

We claim:

1. A method for protecting a network from a virus contained in an e-mail message as executable code, the method comprising:

(a) receiving the e-mail message in a gatekeeper server;

(b) converting the executable code from an executable format to a non-executable format; and

(c) forwarding the non-executable format to the recipient of the e-mail message.

2. The method of claim 1, wherein the executable code is contained in a body of the e-mail message.

3. The method of claim 2, wherein the executable code comprises a hypertext link, and wherein step (b) comprises deactivating the hypertext link.

4. The method of claim 1, wherein the executable code is contained in an attachment in the e-mail message.

5. The method of claim 4, wherein step (b) comprises:

(i) forwarding the attachment from the gatekeeper server to a sacrificial server; and

(ii) converting the attachment to the non-executable format on the sacrificial server.

6. The method of claim 5, wherein step (b) further comprises (iii) examining the sacrificial server for virus activity.

7. The method of claim 6, wherein step (b) further comprises (iv) rebooting the sacrificial server from a safe copy of an operating system obtained from a read-only device.

8. The method of claim 5, wherein communications between the gatekeeper server and the sacrificial server are authenticated using a challenge-and-response technique.

9. The method of claim 4, wherein step (b) comprises:

- (i) maintaining a list of approved attachment types;
- (ii) determining whether the attachment is of a type which is in the list of approved attachment types; and
- (iii) if the attachment is not of a type which is in the list of approved attachment types, informing the recipient that a message containing a non-approved attachment has been received.

10. The method of claim 1, wherein step (b) comprises:

- (i) maintaining a list of approved executable code;
- (ii) determining whether the executable code is in the list of approved executable code; and
- (iii) deactivating the executable code if the executable code is not in the list of approved executable code.

11. The method of claim 10, wherein:

the list of approved executable code includes information for determining whether the approved executable code has been altered; and

step (b) further comprises:

- (iv) determining whether the executable code has been altered; and
- (v) deactivating the executable code if the executable code has been altered.

12. The method of claim 11, wherein step (b)(iv) is performed through an algorithmic technique.

13. The method of claim 12, wherein the algorithmic technique is a check-summing technique.

14. The method of claim 12, wherein the algorithmic technique is a hashing technique.

15. The method of claim 1, wherein step (b) comprises:

- (i) forming a first copy and a second copy of at least a portion of the e-mail message containing the executable code;
- (ii) executing the executable code in the first copy but not the second copy; and
- (iii) after the executable code in the first copy has been executed, comparing the first copy to the second copy to determine an effect of the executable code.

16. A system for protecting a network from a virus contained in an e-mail message as executable code, the system comprising:

- a workstation computer on the network used by an recipient of the e-mail message;
- a gatekeeper server, in communication with the workstation computer over the network, for receiving the e-mail message; and
- a computer on the network for converting the executable code from an executable format to a non-executable format and forwarding the non-executable format to the workstation computer.

17. The system of claim 16, wherein the executable code is contained in a body of the e-mail message.

18. The system of claim 17, wherein the executable code comprises a hypertext link, and wherein the computer for converting deactivates the hypertext link.

19. The system of claim 16, wherein the executable code is contained in an attachment in the e-mail message.

20. The system of claim 16, wherein the computer for converting is a sacrificial server which is separate from the gatekeeper server.

21. The system of claim 20, wherein the sacrificial server is examined for virus activity.

22. The system of claim 21, wherein the network further comprises a read-only device, and wherein the sacrificial server is rebooted from a safe copy of an operating system obtained from the read-only device.

23. The system of claim 20, wherein communications between the gatekeeper server and the sacrificial server are authenticated using a challenge-and-response technique.

24. The system of claim 16, wherein the network maintains a list of approved attachment types, determines whether the attachment is of a type which is in the list of approved attachment types, and, if the attachment is not of a type which is in the list of approved attachment types, informs the recipient that a message containing a non-approved attachment has been received.

25. The system of claim 16, wherein the network maintains a list of approved executable code, determines whether the executable code is in the list of approved executable code, and deactivates the executable code if the executable code is not in the list of approved executable code.

26. The system of claim 25, wherein:

the list of approved executable code includes information for determining whether the approved executable code has been altered;

the network determines whether the executable code has been altered; and

the executable code is deactivated if the executable code has been altered.

27. The system of claim 26, wherein the system determines whether the executable

code has been altered through an algorithmic technique.

28. The system of claim 27, wherein the algorithmic technique is a check-summing technique.

29. The system of claim 27, wherein the algorithmic technique is a hashing technique.

30. The system of claim 16, wherein the computer for converting converts the
5 executable code by:

- (i) forming a first copy and a second copy of at least a portion of the e-mail message containing the executable code;
- (ii) executing the executable code in the first copy but not the second copy;
and
- (iii) after the executable code in the first copy has been executed,
10 comparing the first copy to the second copy to determine an effect of the executable code.

31. A sacrificial server for use on a network, the sacrificial server comprising:
communication means for receiving an e-mail attachment from the network; and
15 processing means for converting the e-mail attachment from an executable format to a non-executable format and for returning the e-mail attachment to the network.

32. The sacrificial server of claim 31, wherein the sacrificial server is examined for virus activity.

33. The sacrificial server of claim 32, wherein the sacrificial server further comprises
20 a read-only device and is rebooted from a safe copy of an operating system obtained from the read-only device.

34. The sacrificial server of claim 31, wherein communications between the network and the sacrificial server are authenticated using a challenge-and-response technique.

35. The sacrificial server of claim 31, wherein the sacrificial server stores a list of
25 approved attachment types, determines whether the attachment is of a type which is in

the list of approved attachment types, and, if the attachment is not of a type which is in the list of approved attachment types, and informs the network that a message containing a non-approved attachment has been received.

36. The sacrificial server of claim 31, wherein the sacrificial server maintains a list of approved executable code, determines whether the attachment contains executable code and whether the executable code is in the list of approved executable code, and deactivates the executable code if the executable code is not in the list of approved executable code.

37. The sacrificial server of claim 36, wherein:

the list of approved executable code includes information for determining whether the approved executable code has been altered;

if the executable code is in the list of approved executable code, the sacrificial server determines whether the executable code has been altered; and

the executable code is deactivated if the executable code has been altered.

38. The sacrificial server of claim 32, wherein the sacrificial server determines whether the executable code has been altered through the use of an algorithmic technique

39. The sacrificial server of claim 38, wherein the algorithmic technique is a check-summing technique.

40. The sacrificial server of claim 38, wherein the algorithmic technique is a hashing technique.

41. The sacrificial server of claim 31, wherein the processing means converts the executable code by:

- (i) forming a first copy and a second copy of at least a portion of the e-mail message containing the executable code;

- (ii) executing the executable code in the first copy but not the second copy;
and
- (iii) after the executable code in the first copy has been executed,
comparing the first copy to the second copy to determine an effect of
the executable code.

5

Abstract of the Disclosure

A network is protected from e-mail viruses through the use of a sacrificial server.

Any executable programs or other suspicious parts of incoming e-mail messages are forwarded to a sacrificial server, where they are converted to non-executable format such as

- 5 Adobe Acrobat PDF and sent to the recipient. The sacrificial server is then checked for virus activity. After the execution is completed, the sacrificial server is rebooted.

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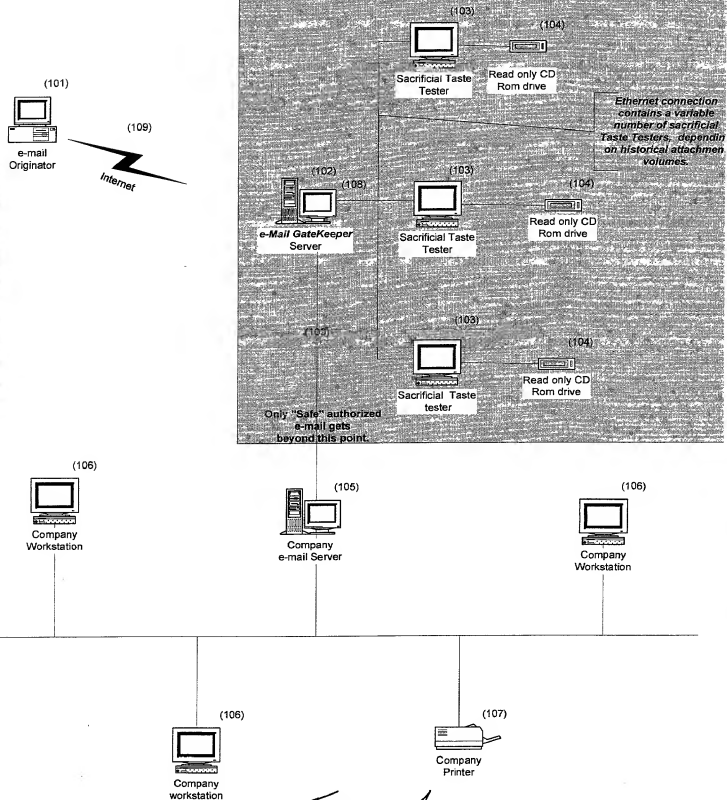
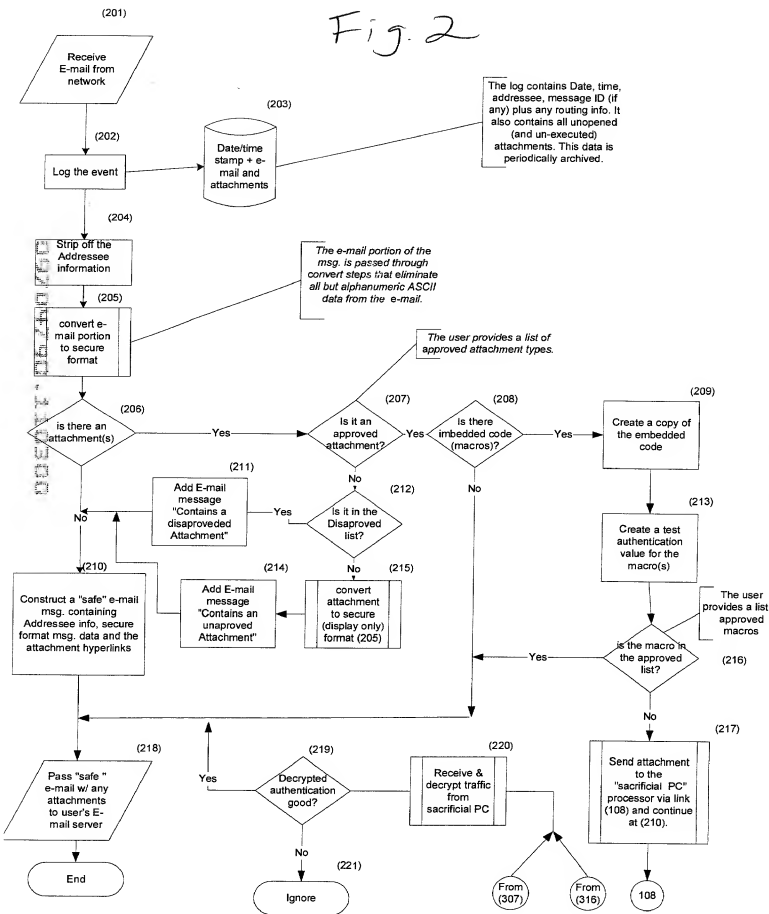


Fig. 1

Fig. 2



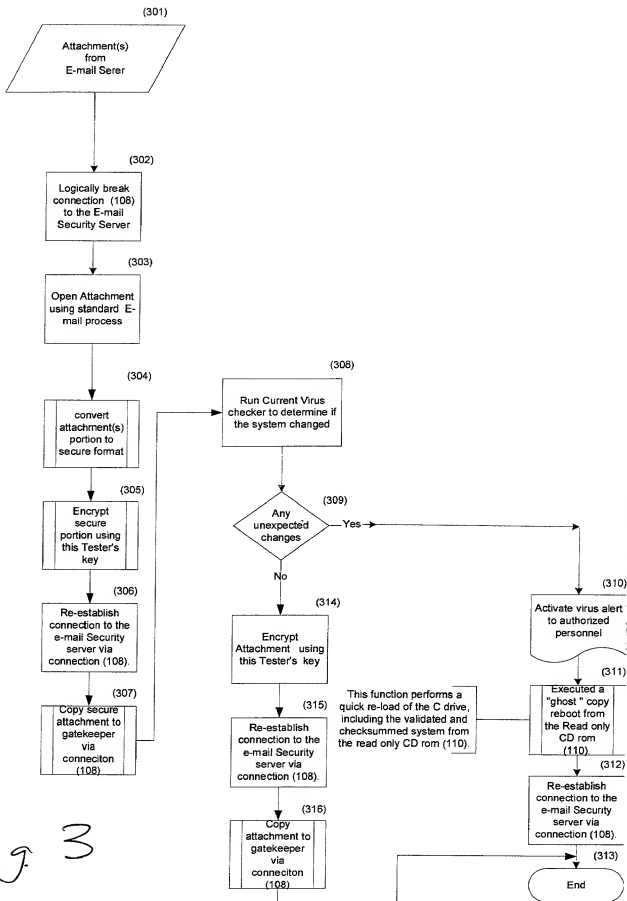


Fig 3

Attorney Docket Number: 109933.00103

DECLARATION FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

E-MAIL VIRUS PROTECTION SYSTEM AND METHOD

the specification of which

☐ is attached hereto

☒ was filed on

as United States Application Number or PCT International

Application Number

and (if applicable) was amended on

I hereby authorize our attorneys to insert the serial number assigned to this application.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR §1.56.

I hereby claim foreign priority benefits under 35 U.S.C. §119(a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed

PRIOR FOREIGN/PCT APPLICATION(S) AND ANY PRIORITY CLAIMS UNDER 35 USC §119

APPLICATION NO.	COUNTRY	DAY/MONTH/YEAR FILED	PRIORITY CLAIMED

I hereby claim the benefit under 35 U.S.C. §119(e) of any United States provisional application(s) listed below.

PROVISIONAL APPLICATION(S) UNDER 35 U.S.C. §119(e)

APPLICATION NUMBER	FILING DATE
60/213,254	June 22, 2000

I hereby claim the benefit under 35 U.S.C. §120 of any United States application, or §365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. §112.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR §1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application.

PRIOR U.S./PCT INTERNATIONAL APPLICATION(S) DESIGNATED FOR BENEFIT UNDER 37 U.S.C. §120

APPLICATION NO.	FILING DATE	STATUS — PATENTED, PENDING, ABANDONED

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected herewith: Herbert Cohen, Reg. No. 25,109; Victor M. Wigman, Reg. No. 25,201; George C. Myers, Jr., Reg. No. 27,040; Donald R. Greene, Reg. No. 22,470; Michael C. Greenbaum, Reg. No. 28,419; Michael D. White, Reg. No. 32,795; Karl O. Neidert, Reg. No. 39,313; David J. Edmondson, Reg. No. 35,126; Denise C. Lane, Reg. No. 42,780; Carl Schaukowitch, Reg. No. 29,211 and James E. Howard, Reg. No. 39,715.

Declaration for Patent Application (Continued)

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full Name of sole or first inventor (given name, family name)

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Date

10-19-2000

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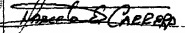
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Residence

Citizenship